Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE COMPARATIVE VALUE OF BACTERIAL AND TEMPERATURE REGULATIONS FOR A CITY'S MILK SUPPLY.

FRANCIS H. SLACK.

(From the Boston Board of Health Laboratory, Boston, Mass.)

IN May, 1904, Boston established a bacterial regulation requiring market milk to contain not more than 500,000 bacteria to the c.c., and a temperature regulation requiring the milk to be kept below 50° F. Since these regulations were established simultaneously, it is impossible to give the effect of each singly in improving the milk supply; but a comparison of temperatures and bacterial counts on the same samples is instructive, and gives an insight into the relative values of the two regulations, each of which is shown to be important.

This paper is based on a total of 11,403 samples taken during three years, from June 1, 1904, to November 1, 1906. During this period both temperatures and plate counts were taken on 8,589 samples. On the remaining 2,814 samples temperatures were taken, but no counts were made, because they were passed as within the limit for bacteria on the microscopic examination alone; the error of this latter method with a careful worker is practically negligible as shown in a previous paper read before this Association.[1] (Of the 2,814 samples so passed 89 per cent were also within the temperature regulation.)

The condition of a milk supply untrammeled by bacterial or temperature regulations may perhaps be approximated by a consideration of the data of the first seven months' work in Boston after the regulations were made and while the work was educational in its character, warning notices alone being sent to those who failed to meet the conditions. The double examination, i. e., bacterial count and temperature, was made on 3,043 samples seized during these 7 months. The results of these examinations are as follows: 54¼ per cent were within both standards; 24¼ per cent had high temperatures with low bacterial content; 12 per cent had high bacterial content with low temperatures and 9½ per cent were outside of both standards. Judging this milk from a temperature standpoint alone, 33¾ per cent would have been condemned instead of 21½ per cent. Of the milk thus condemned on temperature about 72 per cent would have been within the bacterial standard, while over half of the milk which was proven unfit for use by the bacterial examination was at a temperature below 50° F. when the samples were taken.

---

[1] *Rep. and Papers, Amer. Pub. Health Assoc.*, 1905, 31, Pt. 2, p. 214.

The second year, 1905, the previous work began to show results. Inspections were made constantly, warning notices sent as before, and a few cases were fined in court for continued failure to comply with either or both regulations. The samples examined for this second year then may fairly represent a milk supply where these regulations are in effect, and an honest effort is being made to produce a milk supply complying with them. We have results for both temperature and bacterial examination of 4,453 samples for 1905 as follows: 73 per cent were within both standards; 4 per cent had high temperatures with low bacterial content; 20 per cent had high bacterial content with low temperatures, and 3 per cent were outside both standards. Judging this milk from a temperature standpoint alone, 7 per cent would have been condemned instead of 23 per cent; 60 per cent of the milk thus condemned on temperature alone would have been within the bacterial standard and 87 per cent of the milk which bacterial examination showed unfit for use would have escaped notice. These results show a gain of about 20 per cent in milk within both standards and of 26 per cent on the temperature standard alone. The smallness of the gain (1½ per cent) in the amount of milk exceeding the bacterial standard may be explained by the fact that during 1905 over 1,000 samples were taken from stores and wagons, while during the first period of seven months samples were taken at the contractors' receiving stations only. Of samples taken at the receiving stations during this second year only 12¼ per cent had a count above 500,000 to the c.c. or 9¼ per cent less than the preceding year.

During the present year the same conditions prevail. Ice has however been very scarce, and there have been no prosecutions. Under these conditions the milk supply shows some deterioration. Nine hundred and twenty-four samples have been taken from stores and wagons. Up to November 1, we have results for both temperature and bacteriological examination of 3,907 samples, of which 66¾ per cent were within both standards; 9½ per cent had high temperatures with low bacterial content; 19 per cent had high bacterial content with low temperatures, and 4¾ per cent were outside of both standards. Judged from the temperature standpoint alone 14¼ per cent would have been condemned instead of 23¾ per cent; 66 per cent of the milk thus condemned on temperature would have been within the bacterial standard, and 80 per cent of the milk which bacterial examination showed unfit for use was within the required temperature.

A summary of the samples on which both examinations were made for 29 months shows that of a total of 11,403 samples 66 per cent were within both standards; 11¼ per cent had high temperatures with low bacterial content; 17½ per cent had high bacterial content with low temperatures, and 5¼ per cent were outside both standards. Judged from the temperature standpoint alone, 16½ per cent would have been condemned instead of 22¾ per cent. Of the milk thus condemned on temperature, 68 per cent would have been within the bacterial standard, while 77 per cent of the milk which was proven unfit for use from high bacterial content would have escaped notice.

More striking still is a consideration of the relation of temperature and bacterial content at different periods of the year. July is our worst summer month. We have records of 1,153 samples taken during July in the three years; 30½ per cent of these were within both standards; 17¼ per cent had high temperatures with low bacterial content; 35¼ per cent had high bacterial content with low temperatures, and 17 per cent were outside of both standards. If judged by temperature alone 37 per cent would have been condemned instead of 52 per cent. About half of the milk thus condemned on temperature would have been of low bacterial content, while over two-thirds of the milk which bacteriological examination proved unfit for use would have escaped notice. December stands at the other extreme. Of the 552 December samples on which we have records of both temperature and count, 89½ per cent were within both standards; 3¾ per cent had high temperatures with low bacterial content; 6¾ per cent had high bacterial content with low temperatures, and there were

TABLE 1.

COMPARISON OF TEMPERATURE AND COUNT ON SAMPLES TAKEN DURING 29 MONTHS.

Year	TEMPERATURE LOW COUNT LOW			TEMPERATURE HIGH COUNT LOW			TEMPERATURE LOW COUNT HIGH			TEMPERATURE HIGH COUNT HIGH		
	1904	1905	1906	1904	1905	1906	1904	1905	1906	1904	1905	1906
January	...	162	491	...	1	42	...	16	51	...	0	7
February	...	502	369	...	8	31	...	39	24	...	2	1
March	...	459	348	...	17	35	...	78	32	...	1	1
April	...	325	451	...	23	14	...	66	43	...	0	4
May	...	345	111	...	3	11	...	38	126	...	2	8
June	192	346	62	60	58	12	37	92	116	36	41	38
July	209	101	42	181	13	4	103	197	107	111	31	54
August	215	87	212	264	16	70	52	116	72	90	18	28
September	349	40	198	117	4	67	110	114	64	35	21	18
October	252	285	327	45	39	83	27	72	106	11	8	27
November	286	256	...	53	0	..	29	83	...	5	0	..
December	149	345	...	18	2	..	7	31	...	0	0	..
	1,652	3,253	2.611	738	184	369	365	892	741	288	124	186

TABLE 2.

SAME AS TABLE 1. EXCEPT THAT FIGURES FROM DIFFERENT YEARS IN THE SAME MONTH ARE ADDED.

	Temperature Low Count Low	Temperature High Count Low	Temperature Low Count High	Temperature High Count High	Totals
January	653	43	67	7	770
February	871	39	63	3	976
March	807	52	110	2	971
April	776	37	109	4	926
May	456	14	164	10	644
June	600	130	245	115	1,090
July	352	198	407	196	1,153
August	514	350	240	136	1.240
September	587	188	288	74	1,137
October	864	167	205	46	1.282
November	542	53	62	5	662
December	494	20	38	0	552
Totals	7,516	1,291	1,998	598	11.403

TABLE 3.

SAME AS PREVIOUS TABLE BUT EXPRESSED IN PERCENTAGE.

	Temperature Low Count Low	Temperature High Count Low	Temperature Low Count High	Temperature High Count High
January	84.80%	5.59%	8.70%	0.91%
February	89.24	4.00	6.45	0.31
March	83.12	5.35	11.33	0.21
April	83.80	4.00	11.77	0.43
May	70.82	2.17	25.46	1.55
June	55.05	11.92	22.48	10.55
July	30.53	17.17	35.30	17.00
August	41.45	28.23	19.35	10.97
September	51.63	16.54	25.33	6.50
October	67.39	13.03	16.00	3.58
November	81.87	8.01	9.37	0.75
December	89.50	3.62	6.88	0.00
Totals	65.91%	11.32%	17.52%	5.25%

TABLE 4.

SHOWING COMPARISON OF TEMPERATURE AND BACTERIAL CONTENT FOR THE DIFFERENT YEARS.

	Temperature Low Count Low	Temperature High Count Low	Temperature Low Count High	Temperature High Count High	Totals
June 1 to Dec. 31, '04......	1,652 or 54.29%	738 or 24.25%	365 or 12.00%	288 or 9.46%	3,043
Jan. 1 to Dec. 31, '05.......	3,253 or 73.05	184 or 4.13	892 or 20.03	124 or 2.79	4,453
Jan. 1 to Oct. 31, '06.......	2,611 or 66.83	369 or 9.44	741 or 18.97	186 or 4.76	3,907

no samples outside of both standards. If judged by temperature alone, 3¾ per cent would have been condemned instead of 6¾ per cent. All the milk thus condemned on temperature would have been good as to bacterial content, while all the milk which the bacterial examination proved unfit for use would have escaped notice.

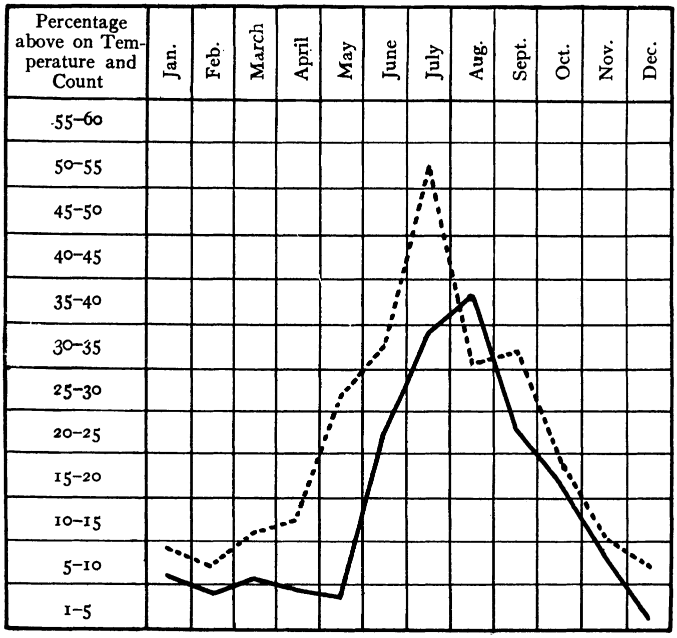

CHART 1.

COMPARISON OF TEMPERATURE AND COUNT.

This diagram shows average high temperature (plain line) and high count (dotted line) milk for 29 months, June 1, 1904, to November 1, 1906. While they follow the same curve almost exactly, the high count milk is for the most part low temperature, and vice versa, as shown by the preceding tables. Such a chart as this is apt to be quite misleading if all the factors are not stated.

In attempting comparison of these two tests it is necessary first to point out the relative scope of each. The dealer whose milk complies with the *bacterial* standard must, we believe, have good cows, well housed and tended, must handle his milk in a cleanly manner, must cool his milk, and transmit it without delay to the consumer. These four points, emphasized many times heretofore, are the essential factors in producing good clean milk. It is evident that the temperature standard forces the observance of but one of the factors, cold, while the bacterial standard forces the observance of all four.

Unquestionably, the temperature factor is an important one in the production of good milk, especially in hot weather, since the condemnation of milk on the temperature standard alone, if widely applied at all stages of the progress of the milk from producer to consumer, would undoubtedly result in a very general observance of the temperature regulation. It can, however, never accomplish what the bacterial standard accomplishes.

The temperature test has the advantage of being less arduous, since the temperature of many samples may be taken with less labor than that required for one bacterial examination, but it is probably true that in a large city it is of comparatively little importance whether 20 or 100 samples are examined in a day, so long as samples are seized every day without notice.

If either test is to be chosen, to the entire exclusion of the other, the count is undoubtedly the one to choose, since to keep milk low in bacterial count would necessitate its being kept cold.